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REMARKS

Claims 1-32, and 36-37 are pending in the present application. No amendments are submitted herewith. Reconsideration and allowance of the claims is respectfully requested in view of the following remarks.

Claim Rejections Under 35 U.S.C.§ 103(a)

Claims 1, 4, 6-16, 18, 20-22, 25-32, 36, and 37 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,258,233 to Sugiyama et al. in view of U.S. Patent No. 4,221,650 to Friese et al. with evidence provided by Practical Handbook of Material Science. Applicants respectfully traverse this rejection.

Applicants' independent Claims 1 and 16 teach a method of making a zirconia-alumina body comprising, *inter alia*, mixing zirconia, yttria, and alumina with at least one solvent to form a mixture, wherein the zirconia-alumina body comprises about 1 weight% to about 45 weight% monoclinic phase zirconia, based upon the total weight of the zirconia.

Sugiyama et al. teach a zirconia solid electrolytic body made of a partially stabilized zirconia containing 5-7 mol% yttria having a mixed phase structure including a cubic phase, a monoclinic phase, and a tetragonal phase. (Abstract) As noted by the Examiner, "Sugiyama does not explicitly suggest also including alumina to the zirconia mixture." (Paper 7, page 3). Moreover, Sugiyama et al. focus on producing a gas tight and strong zirconic solid electrolyte body by focusing on the sintered grain sizes, moloclinic to cubic ratio, and the relative densities of the electrolyte and the adjacent alumina body. (Col. 3) They teach that the zirconia solid electrolyte body having a relative density of 94-100% with a mean sintered grain size of 0.5-3.0 micrometers, and the alumina substrate has relative density of 95-100% with a mean sintered grain size of 0.5-4.0 micrometers. (Abstract) They further discuss that the desired gas tight, strong electrolyte is not obtained outside of these ranges. (Col. 3., lines 5 – 13 and line 65 – Col. 4, line 4)

Friese et al. teach an oxygen sensor having a fine-grained stabilized cubic zirconium dioxide electrolyte contact respective electrodes. (Abstract) Frieze et al. do not teach, *inter alia*, a zirconia-alumina body comprising about 1 weight% to about 45 weight% monoclinic phase zirconia, based upon the total weight of the zirconia.

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For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was make. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

Since the above cited references do not disclose all the elements of the Applicants' claimed invention, e.g., mixing zirconia, yttria and alumina with at least one solvent to form a mixture, the Examiner must show some suggestion or incentive that would have motivated a skilled artisan to modify the reference. The Examiner has failed to show the suggestion or incentive that would have motivated the skilled artisan to modify the reference or combined references with a reasonable expectation of success. As such, a *prima facie* case for obviousness has not been made. Accordingly, the obviousness rejection is improper.

paragraph bridging 2&3

Applicants further maintain that the Examiner has used an improper standard in arriving at the rejection of the above claims under section 103, based on improper hind sight which fails to consider the totality of Applicants' invention and the totality of the cited references. More specifically the Examiner has used Applicants' disclosure to select portions of the cited references to allegedly arrive at Applicant's invention. In doing so, the Examiner has failed to consider the teachings of the references or Applicants' invention as a whole in contravention of section 103.

what about the whole teaches one away from the reject

In applying Section 103, the U.S. Court of Appeals for the Federal Circuit has consistently held that one must consider both the invention and the prior art "as a whole", not from improper hindsight gained from consideration of the claimed invention. See, *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985) and cases cited therein.

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According to the *Interconnect* court

> [n]ot only must the claimed invention as a whole be evaluated, but so also must the references as a whole, so that their teachings are applied in the context of their significance to a technician at the time -- a technician without our knowledge of the solution.

The Examiner has selected portions from Sugiyama et al. and Friese et al. and stated "it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of Friese for the method of Sugiyama in order to improve the constructed sensors heat conductivity and reduce its coefficient of expansion." (Paper 7, page 3). However, the Examiner has not shown how the above cited references considered as whole provide the suggestion or incentive that would have motivated the skilled artisan to modify the reference or combined references with a reasonable expectation of success. For example, Sugiyama et al. considered as a whole, as is required by law, do not teach the use of alumina in zirconia body. Rather, Sugiyama et al. teach that very specific details of the zirconia solid electrolyte body are critical to obtain their desired gas tight, strong electrolyte. Namely, they teach that the electrolyte has 5 – 7 mol% yttria, a relative density of 94-100% and a mean sintered grain size of 0.5-3.0 micrometers, while the alumina substrate has relative density of 95-100% with a mean sintered grain size of 0.5 – 4.0 micrometers. (Abstract) They further teach that the specific amount of the yttria is critical by teaching that when a M/C ratio of 0.05 to 0.25 is necessary to obtain the desired coefficient of thermal expansion and that when the M/C ratio is 0.05 to 0.25, the yttria content is approximately 4.5 – 6.5 mol. (Col. 3, line 65 – Col. 4, line 4) In other words, the composition, sintered grain size, and relative density are all critical factors.

agree, hence Sug. does not anticipate

There is no suggestion in Sugiyama et al. that mixing alumina with the zirconia would not adversely affect the M/C, the sintered grain size and/or any other of the desired properties. There is NO motivation or expectation of success in such a modification. To the contrary, based upon the teaching of Sugiyama et al. as a whole, modification of their composition is not desired. For example, there is no teaching or suggestion that mixing alumina into the electrolyte of Sugiyama et al. would not adversely affect the sintered grain sizes as taught. Moreover, Sugiyama et al. teach that if the mean sintered grain size of the zirconia solid electrolyte body is 0 to 0.5 micrometers, it is difficult in manufacturing of the zirconia solid electrolytic body to attain the relative density of 94% or more even if the industrially obtainable finest material is used, and as

Why would it? Alumina is an inert material so it would affect M/C

2) Friese already understood the impact of Alumina on grain size (col. 9)

such a gas tight and strong zirconic solid electrolytic body cannot be obtained. (Col. 3, lines 7-13). As a whole, Sugiyama et al. teaches the desirability and necessity of specific parameters. Consequently, Sugiyama et al. fail to provide support or motivation to modify the reference as suggested by the Examiner. As such, the obviousness rejection is improper.

Furthermore, Friese et al. do no teach or suggest mixing zirconia, yttria, and alumina with at least one solvent to form a mixture, wherein the zirconia-alumina body comprises about 1 weight% to about 45 weight% monoclinic phase zirconia, based upon the total weight of the zirconia. As such, Friese et al. fail to cure the deficiencies of Sugiyama et al. More particularly, Friese et al. fail to provide any suggestion or incentive for combining their teaching with Sugiyama et al. such that Sugiyama et al. will still function as taught. There is no teaching or suggestion in Friese et al. that the addition of alumina to a yttria stabilized zirconia solid electrolyte will maintain the required properties set forth in Sugiyama et al. For example, Friese et al. fail to discuss the affect of alumina on grain size or density.

Considering that, when read as a whole Sugiyama et al. would, if anything, teach away from modification, due to the potential disruption of the properties necessary to attain a gas tight and strong zirconic solid electrolyte, and since Friese et al. fail to provide an incentive to modify Sugiyama et al. and/or an expectation of success, combination of these references is not proper, and the Examiner has not made a *prima facie* case of obviousness. For at least these reasons, Applicants' amended independent Claims 1 and 16 are non-obvious over Sugiyama et al. in view of Friese et al. Additionally, as dependent claims from allowable independent Claims 1 and 16, Claims 2-15, 17-32, and 36-37 are, by definition, also allowable. Reconsideration and withdrawal of this rejection are requested.

Claims 2, 3, and 24 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,258,233 to Sugiyama et al. in view of U.S. Patent No. 4,221,650 to Friese et al., and further in view of U.S. Patent No. 5,968,673 to Aizawa et al. Applicants respectfully traverse this rejection.

Aizawa et al. teach a solid electrolyte thin film and a manufacturing method for the same. The solid electrolyte thin film comprises yttria stabilized zirconia. The method includes regulating the grain size of solid electrolyte powders in the range of 0.1 to 5 microns. (Abstract)

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However, Aizawa et al. do not teach or suggest mixing zirconia, yttria, and alumina with at least one solvent to form a mixture, wherein the zirconia-alumina body comprises about 1 weight% to about 45 weight% monoclinic phase zirconia, based upon the total weight of the zirconia. Actually, Aizawa et al., as with Sugiyama et al., fail to mention a zirconia alumina body. As such, Aizawa et al. fail to cure the defects of Sugiyama et al., and Friese et al. (as discussed above), fail provide any suggestion or motivation for combining these references, and fail to provide any expectation of success in such a combination. Consequently, an obviousness rejection employing the combination of Sugiyama et al., Friese et al., and Aizawa et al., is improper and fails to render the present claims obvious. Reconsideration and withdrawal of this rejection are requested.

Claims 5 and 23 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,258,233 to Sugiyama et al. in view of U.S. Patent No. 4,221,650 to Friese et al., and further in view of U.S. Patent No. 4,897,174 to Wang et al. Applicants respectfully traverse this rejection.

Wang et al. disclose a gas sensing apparatus having a sensor element of yttria-stabilized zirconia. (Abstract) They teach that, after mixing, a slurry is exposed to a vacuum of 30 mm Hg for 1-2 minutes to ensure that no trapped air remains in the slurry (Col. 3, lines 32-34). The Examiner stated that it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Wang et al. for the method of Sugiyama et al. and Friese et al. to ensure that there is no trapped air in the mixture. (Paper 7, page 6). However, Wang et al. fail to cure the deficiencies of the above cited art, i.e., they do not teach or suggest mixing zirconia, yttria, and alumina with at least one solvent to form a mixture, wherein the zirconia-alumina body comprises about 1 weight% to about 45 weight% monoclinic phase zirconia, based upon the total weight of the zirconia. Actually, Wang et al., as with Aizawa et al., and Sugiyama et al., fail to mention a zirconia alumina body. As such, Wang et al. fail to cure the defects of Sugiyama et al., Friese et al. (as discussed above), fail provide any suggestion or motivation for combining these references, and fail to provide any expectation of success in such a combination. Consequently, an obviousness rejection employing the combination of

Sugiyama et al., Friese et al., and Wang et al., is improper and fails to render the present claims obvious. Reconsideration and withdrawal of this rejection are requested.

Claim 17 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,258,233 to Sugiyama et al. in view of U.S. Patent No. 4,221,650 to Friese et al., and further in view of U.S. Patent No. 5,849,165 to Kojima et al. Applicants respectfully traverse this rejection.

Kojima et al. teach an oxygen sensor element (zirconia solid electrolyte) for detecting oxygen concentration in an exhaust gas having a protective layer made of a heat resistant metal oxide. However, Kojima et al. fail to cure the deficiencies of the above cited art, i.e., they do not teach or suggest mixing zirconia, yttria, and alumina with at least one solvent to form a mixture, wherein the zirconia-alumina body comprises about 1 weight% to about 45 weight% monoclinic phase zirconia, based upon the total weight of the zirconia. As with Aizawa et al., Wang et al., and Sugiyama et al., Kojima et al. fail to mention a zirconia alumina body. As such, Wang et al. fail to cure the defects of Sugiyama et al., Friese et al. (as discussed above), fail provide any suggestion or motivation for combining these references, and fail to provide any expectation of success in such a combination. Consequently, an obviousness rejection employing the combination of Sugiyama et al., Friese et al., and Kojima et al., is improper and fails to render the present claims obvious. Reconsideration and withdrawal of this rejection are requested.

Claim 19 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,258,233 to Sugiyama et al. in view of U.S. Patent No. 4,221,650 to Friese et al. and further in view of U.S. Patent No. 6,346,178 to Lankheet. Applicants respectfully traverse this rejection on the grounds that Lankheet is not a proper prior art reference and that it fails to render the present application obvious. Lankheet, which is commonly assigned with the present application to Delphi Technologies, Inc., is not a proper reference as is set forth in MPEP 2137.01, and 35 U.S.C. §103(c).

Additionally, even if it were a proper reference, Lankheet discloses a simplified wide range air fuel ratio sensor and teach that the ground plane, which can be disposed between two of the substrate layers, inhibits sodium induced heater failure by drawing sodium ions out of the

substrate and retaining them (Col. 4, lines 52-55). The Examiner states that it would have been obvious to utilize the teaching of Lankheet for Sugiyama et al. and Friese et al. in order to prevent the premature failure of the heater. (Paper 7, page 6). However, Lankheet fails to cure the deficiencies of the above cited art, i.e., they do not teach or suggest mixing zirconia, yttria, and alumina with at least one solvent to form a mixture, wherein the zirconia-alumina body comprises about 1 weight% to about 45 weight% monoclinic phase zirconia, based upon the total weight of the zirconia. Lanheet fails to provide any suggestion or motivation for combining Sugiyama et al. and Friese et al., nor do they suggest any expectation of success in combining the above references. For at least these reasons, this rejection is improper. Reconsideration and withdrawal of this rejection is requested.

Neither Kojima et al., Wang et al., Aizawa et al., Lankheet, nor Friese et al., provide a teaching, suggestion, or motivation to modify Sugiyama et al. to mix zirconia, yttria, and alumina with at least one solvent to form a mixture, disposing the mixture adjacent to an unfired alumina body, and co-firing, wherein the zirconia-alumina body comprises about 1 weight% to about 45 weight% monoclinic phase zirconia, based upon the total weight of the zirconia, these references fail to render the present application, as claimed, obvious. Sugiyama et al., as a whole, teach a very specific combination of materials and properties to attain a particular electrolyte. In order to arrive at the combination suggested in the Final Rejection, an artisan would have to ignore the teachings of the main reference Sugiyama et al. to the effects of being outside of the various ranges on the resulting electrolyte. (no motivation and no expectation of success) Then the artisan would have to pick and choose the alumina of Friese et al. to combine with the binary electrolyte of Sugiyama et al. (no motivation, picking and choosing, and no expectation of success) The artisan would then need to assure that the alumina would not adversely effect the monoclinic/cubic ratio of Sugiyama et al. to attain a ratio of M/C as claimed. (no motivation or expectation of success) Then the artisan would need to pick and choose various other amounts, properties, etc. of various binary electrolytes set forth in the other cited references to attain the limitations of the dependent claims. (no motivation, expectation of success, and, in some cases, improper use of inherency in an obviousness rejection) There is no expectation of success to modify the specific electrolyte of Sugiyama et al. as suggested. The present application teaches

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an claims a unique, co-fired zirconia alumina body that is non-obvious over the references of record. Reconsideration and withdrawal of these rejections are requested.

It is believed that the foregoing remarks fully comply with the Final Rejection and that the claims herein are allowable to Applicants. Accordingly, reconsideration and withdrawal of the rejection and allowance of the case are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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